08/407567

=> d l6 1-147

1. 5,743,625, Apr. 28, 1998, Curved housing assembly for illuminated glass tubing and method; Walter Keisler Tanner, 362/216, 218, 219, 221, 222, 223, 224 [IMAGE AVAILABLE]

2. 5,737,419, Apr. 7, 1998, Computer system for securing communications using split private key asymmetric cryptography; Ravi Ganesan, 380/21, 30 [IMAGE AVAILABLE]

3. 5,729,924, Mar. 24, 1998, Illuminating sign assembly; Charles J. Reading, 40/564, 572, 574, 575; 362/183 [IMAGE AVAILABLE]

4. 5,709,052, Jan. 20, 1998, Modular casket display system; Lajos L. Szabo, Sr., et al., 52/36.1, 36.4, 236.3, 239; 211/202; 312/114, 223.5 [IMAGE AVAILABLE]

5. 5,683,780, Nov. 4, 1997, Modular carpet tile mat construction and process of making same; Malcolm David Rodger, et al., 428/95, 316.6; 442/66, 71, 164 [IMAGE AVAILABLE]

6. 5,666,751, Sep. 16, 1997, **Modular sign** system; Benjamin L. Garfinkle, 40/605, 611, 617 [IMAGE AVAILABLE]

7. 5,625,981, May 6, 1997, Composite window assembly for an automotive vehicle; George W. Klein, et al., 49/227, 351; 296/146.16 [IMAGE AVAILABLE]

8. 5,618,141, Apr. 8, 1997, Modular merchandise signage system; Steven V. Field, 40/606, 607; 248/207; 403/375 [IMAGE AVAILABLE]

9. 5,588,238, Dec. 31, 1996, **Sign** comprised of a carrier frame and manually arrangeable **modular** information grids and pictorials; Joseph E. Visocky, et al., 40/618, 575, 611 [IMAGE AVAILABLE]

10. 5,581,922, Dec. 10, 1996, Display system; Lindalou L. Y. Heimann, 40/605, 729, 730; 434/172 [IMAGE AVAILABLE]

11. 5,557,869, Sep. 24, 1996, Devices for alteration and display of chemiluminescent light; Andre J. T. Douglas, 40/542, 605; 362/34, 812 [IMAGE AVAILABLE]

12. 5,555,660, Sep. 17, 1996, Modular signage system; Roger Whitehouse, et al., 40/622, 594, 621, 657; 434/365; 446/137, 901 [IMAGE AVAILABLE]

13. 5,553,373, Sep. 10, 1996, Photoelectric control module installation device; James M. Sprayberry, 29/758, 278, 764; 81/53.11, 53.12 [IMAGE AVAILABLE]

14. 5,539,623, Jul. 23, 1996, Lighting device used in an exit sign; Alan J. Gurz, et al., 362/20; 40/564, 570; 362/252, 349, 800, 812 [IMAGE AVAILABLE]

15. 5,535,276, Jul. 9, 1996, Yaksha, an improved system and method for securing communications using split private key asymmetric cryptography; Ravi Ganesan, 380/25, 4, 21, 23, 46, 49 [IMAGE AVAILABLE]

16. 5,524,394, Jun. 11, 1996, Modular casket display system; Lajos L.

Szabo, Sr., et al., 52/36.1, 238.1, 239, 243, 582.1, 586.1; 403/331, 381 [IMAGE AVAILABLE]

17. 5,506,596, Apr. 9, 1996, Reduced tension **modular** neon **sign** system; David Pacholok, 345/42, 41; 439/226 [IMAGE AVAILABLE]

18. 5,500,088, Mar. 19, 1996, Automatic refiner load control; Bruce J. Allison, et al., 162/198, 254, 261; 241/30, 36; 364/157, 176 [IMAGE AVAILABLE]

19. 5,499,948, Mar. 19, 1996, Modular threshing assembly for a combine; Mark R. Underwood, 460/119; 56/14.6 [IMAGE AVAILABLE]

20. 5,497,888, Mar. 12, 1996, Modular display system; Dean Michaels, et al., 211/10, 50, 189; 312/107 [IMAGE AVAILABLE]

21. 5,467,548, Nov. 21, 1995, Protective barrier members for work areas; Charles N. Ross, 40/612; 116/63C; 404/9 [IMAGE AVAILABLE]

22. 5,463,274, Oct. 31, 1995, Planar fluorescent lamp having a serpentine chamber and sidewall electrodes; Mark D Winsor, 313/493, 491 [IMAGE AVAILABLE]

23. 5,448,045, Sep. 5, 1995, System for protecting computers via intelligent tokens or smart cards; Paul C. Clark, 235/382; 380/4, 25 [IMAGE AVAILABLE]

24. 5,437,116, Aug. 1, 1995, **Modular sign** system; Stephen N. Hardy, 40/605; 211/189 [IMAGE AVAILABLE]

25. 5,428,914, Jul. 4, 1995, Modular signage system; Roger Whitehouse, et al., 40/621, 594, 622, 657; 434/365; 446/137, 901 [IMAGE AVAILABLE]

26. 5,422,638, Jun. 6, 1995, Stand for a remotely operated road sign; Samuel Singer, et al., 340/908.1; 40/610; 116/63P [IMAGE AVAILABLE]

27. 5,417,604, May 23, 1995, Kit suitable for forming decorative signs; Andrew Rafelman, et al., 446/124; 40/594, 595; 273/282.1, 290; 434/171, 172; 446/98, 901 [IMAGE AVAILABLE]

28. 5,412,893, May 9, 1995, Manually operable scrolling web sign; Robert B. Aiken, Sr., 40/518, 573 [IMAGE AVAILABLE]

29. 5,411,127, May 2, 1995, Escalators; Alexander Findlay, 198/333, 502.1 [IMAGE AVAILABLE]

30. 5,405,017, Apr. 11, 1995, Modular casket display system; Lajos L. Szabo, Sr., et al., 211/13.1; 27/27; 211/175, 189 [IMAGE AVAILABLE]

31. 5,379,540, Jan. 10, 1995, **Modular sign** system; Kent D. Howard, 40/558, 573, 605; 362/226 [IMAGE AVAILABLE]

32. 5,349,551, Sep. 20, 1994, Device for and method of preforming an N-bit modular multiplication in approximately N/2 steps; John Petro, 364/746, 754.01 [IMAGE AVAILABLE]

33. 5,343,646, Sep. 6, 1994, Sign apparatus with improved mounting of message panels; Ronald W. Cobb, et al., 40/585, 618, 622 [IMAGE AVAILABLE]

34. 5,343,116, Aug. 30, 1994, Planar fluorescent lamp having a serpentine chamber and sidewall electrodes; Mark D. Winsor, 313/493, 491 [IMAGE AVAILABLE]

35. 5,329,717, Jul. 19, 1994, Multifaceted **modular sign** system and components; John V. Follis, 40/605, 622 [IMAGE AVAILABLE]

36. 5,299,020, Mar. 29, 1994, Method and apparatus for generating a screened reproduction of an image using stored dot portions; Ephraim A. Carlebach, 358/298, 459, 460, 536 [IMAGE AVAILABLE]

37. 5,267,405, Dec. 7, 1993, Interchangeable **sign** system and **modular** digit carrier therefor; Patrick J. Seggerson, 40/618, 5, 611, 657 [IMAGE AVAILABLE]

38. 5,259,051, Nov. 2, 1993, Optical fiber interconnection apparatus and methods of making interconnections; John J. Burack, et al., 385/76; 29/846, 850; 156/60, 158; 174/259; 385/14, 49, 51, 52, 89, 90, 91, 147 [IMAGE AVAILABLE]

39. 5,237,449, Aug. 17, 1993, Biased lenticular sign system; Jordan R. Nelson, et al., 359/532, 529, 534, 542, 551, 552 [IMAGE AVAILABLE]

40. 5,230,175, Jul. 27, 1993, Multifaceted **modular sign** system and components; John V. Follis, 40/605, 622 [IMAGE AVAILABLE]

41. 5,215,399, Jun. 1, 1993, Road-traffic barricade or barrier with tire base; James Berger, 404/6 [IMAGE AVAILABLE]

42. 5,209,492, May 11, 1993, Shooting target stand; Phillip D. Hamilton, 273/407; 248/463 [IMAGE AVAILABLE]

43. 5,187,641, Feb. 16, 1993, Patient monitoring unit and care station; James M. Muskatello, et al., 361/682; 52/28; 248/918; 312/223.2; 361/680; D14/106 [IMAGE AVAILABLE]

44. 5,184,116, Feb. 2, 1993, Back-lightable diffusive display sign; Ronald R. Daugherty, et al., 345/109; 40/447; 340/815.44, 815.55; 345/55; 362/355 [IMAGE AVAILABLE]

45. 5,165,186, Nov. 24, 1992, Sign readable at speed; Edwin J. Smith, 40/427, 454; 352/58, 81 [IMAGE AVAILABLE]

46. 5,163,158, Nov. 10, 1992, Modular communications system including a portable unit range extender and selective-call system; Robert K. Tendler, et al., 455/11.1, 38.1 [IMAGE AVAILABLE]

47. 5,136,557, Aug. 4, 1992, Modular watch collar; Ilan Plawker, et al., 368/316; 248/116 [IMAGE AVAILABLE]

48. 5,107,551, Apr. 28, 1992, Multiple accessory swimming pool coping; Donald H. Weir, et al., 4/496, 498, 506; 52/300 [IMAGE AVAILABLE]

49. 5,105,567, Apr. 21, 1992, Quick change plural display device; Michael E. Real, 40/765, 776 [IMAGE AVAILABLE]

50. 5,083,390, Jan. 28, 1992, **Modular sign**; David C. Edman, 40/606, 610; 403/263 [IMAGE AVAILABLE]

51. 5,079,464, Jan. 7, 1992, Multiply compartmented dynamoelectric machine; James L. King, et al., 310/89; 417/423.14 [IMAGE AVAILABLE]

52. 5,078,459, Jan. 7, 1992, Bracket for a can dispenser; William C. Sclater, 312/45; 211/59.2; 248/220.31, 225.21; 312/247 [IMAGE AVAILABLE]

53. 5,073,972, Dec. 17, 1991, Modular communications system including a portable unit range extender and selective-call system; Robert K. Tendler, et al., 455/35.1, 38.2, 38.4, 212 [IMAGE AVAILABLE]

54. 5,073,336, Dec. 17, 1991, Corrosion resistant zirconium alloys containing copper, nickel and iron; Dale F. Taylor, 376/457, 414, 416, 417 [IMAGE AVAILABLE]

55. 5,050,747, Sep. 24, 1991, Coupon display and distribution unit; Richard G. Krautsack, 211/50, 55 [IMAGE AVAILABLE]

56. 5,050,120, Sep. 17, 1991, Residue addition overflow detection processor; Theodore L. Houk, 364/746; 341/83; 364/713, 745.03 [IMAGE AVAILABLE]

57. 5,046,545, Sep. 10, 1991, Tension mounting system and assembly; Russell M. Loomis, et al., 160/368.1; 38/102.91; 160/328, 378 [IMAGE AVAILABLE]

58. 5,012,603, May 7, 1991, Sign systems; Kenneth W. A. Elcock, 40/605, 574, 606, 607 [IMAGE AVAILABLE]

59. 5,006,743, Apr. 9, 1991, Multiple compartmented dynamoelectric machine; James L. King, et al., 310/89, 42 [IMAGE AVAILABLE]

60. 4,998,365, Mar. 12, 1991, Segmented neon display; Donald J. Bezek, 40/545, 451 [IMAGE AVAILABLE]

61. 4,995,183, Feb. 26, 1991, Scrolling sign with improved web guide; Robert B. Aiken, Sr., 40/518, 471 [IMAGE AVAILABLE]

62. 4,977,698, Dec. 18, 1990, Display sign system; Patrick J. Seggerson, 40/618, 564, 576 [IMAGE AVAILABLE]

63. 4,948,959, Aug. 14, 1990, Optical computer including pipelined conversion of numbers to residue representation; Theodore L. Houk, et al., 250/578.1; 364/746 [IMAGE AVAILABLE]

64. 4,939,687, Jul. 3, 1990, Serial-parallel multipliers using serial as well as parallel addition of partial products; Richard I. Hartley, et al., 364/757 [IMAGE AVAILABLE]

65. 4,924,496, May 8, 1990, Automatic incoming telephone call originating number and party display system; Romek Figa, et al., 379/142, 131, 199, 355 [IMAGE AVAILABLE]

66. 4,922,988, May 8, 1990, Tension mounting system and assembly; Russell M. Loomis, 160/368.1; 38/102.1; 40/603; 160/378 [IMAGE AVAILABLE]

67. 4,916,840, Apr. 17, 1990, **Modular sign** system; Alan J. Getz, 40/605, 611 [IMAGE AVAILABLE]

68. 4,912,755, Mar. 27, 1990, Line current test device; Dennis C. Blood, et al., 379/6, 21, 27, 32 [IMAGE AVAILABLE]

69. 4,910,699, Mar. 20, 1990, Optical computer including parallel residue to binary conversion; C. David Capps, et al., 364/746, 713 [IMAGE AVAILABLE]

70. 4,905,390, Mar. 6, 1990, Illuminated display; Johann Stilling, 40/549, 564, 574 [IMAGE AVAILABLE]

71. 4,862,039, Aug. 29, 1989, Line regulated ballast circuit; Edwin N. Kile, et al., 315/194, 199, 206, 224, 279, 287, DIG.7 [IMAGE AVAILABLE]

72. 4,837,829, Jun. 6, 1989, Acoustic sound system for a room; William E. Lobb, 381/83 [IMAGE AVAILABLE]

73. 4,800,947, Jan. 31, 1989, Tension mounting system and assembly; Russell M. Loomis, 160/368.1; 38/102.91; 160/378; 248/231.41, 488 [IMAGE AVAILABLE]

74. 4,799,182, Jan. 17, 1989, Cellular floating-point serial pipelined

multiplier; Warren Marwood, 364/748.09 [IMAGE AVAILABLE]

75. 4,791,417, Dec. 13, 1988, Display device; Tadeusz Bobak, 345/89, 94, 149 [IMAGE AVAILABLE]

76. 4,747,121, May 24, 1988, Remote control slide projector module; Albert J. Nash, et al., 379/102.03, 202 [IMAGE AVAILABLE]

77. 4,745,960, May 24, 1988, Collapsible partition assembly; S. J. Karp, 160/84.07; 40/607, 610 [IMAGE AVAILABLE]

78. 4,742,633, May 10, 1988, **Modular** post-mounted **sign** apparatus; Robert R. Snediker, 40/607, 611 [IMAGE AVAILABLE]

79. 4,724,844, Feb. 16, 1988, Vital **sign modular** unit; Stephen Rafelson, 600/483; 5/643; 312/111; 600/508; D24/186 [IMAGE AVAILABLE]

80. 4,718,185, Jan. 12, 1988, Modular solar generating system; Kevin L. Conlin, et al., 40/442; 136/251, 291; 320/155; 362/183 [IMAGE AVAILABLE]

81. 4,704,610, Nov. 3, 1987, Emergency vehicle warning and traffic control system; Michel R. Smith, et al., 340/906 [IMAGE AVAILABLE]

82. 4,680,883, Jul. 21, 1987, Scroll module and sign system for internally illuminated signs; Robert C. Stadjuhar, et al., 40/471, 467, 483, 518 [IMAGE AVAILABLE]

83. 4,679,341, Jul. 14, 1987, **Modular** display apparatus for **sign** panels; John G. Goldman, 40/611, 490, 605, 765; 428/14 [IMAGE AVAILABLE]

84. 4,644,488, Feb. 17, 1987, Pipeline active filter utilizing a booth type multiplier; Robert Nathan, 364/724.05, 757; 382/303 [IMAGE AVAILABLE]

85. 4,641,446, Feb. 10, 1987, Apparatus and method for producing a multisided, multicolored display; Thomas L. Jackson, 40/444, 581 [IMAGE AVAILABLE]

86. 4,641,247, Feb. 3, 1987, Bit-sliced, dual-bus design of integrated circuits; Ronald C. Laugesen, et al., 364/490 [IMAGE AVAILABLE]

87. 4,631,569, Dec. 23, 1986, Means and method of reducing the number of masks utilized in fabricating complex multi-level integrated circuits; Donald F. Calhoun, 257/211, 203 [IMAGE AVAILABLE]

88. 4,609,183, Sep. 2, 1986, Shopping cart corral kit and method of assembling a corral from the component parts of the kit; Harrold Ulmer, 256/1, 24, 25, 65 [IMAGE AVAILABLE]

89. 4,604,820, Aug. 12, 1986, **Modular sign**; David C. Edman, 40/605, 611 [IMAGE AVAILABLE]

90. 4,604,712, Aug. 5, 1986, Apparatus for controlling reproduction of text characters whose form depends on adjacency of other characters; Hans Orrhammar, 395/110; 101/93.04; 178/30; 341/28; 345/142; 364/919.1, 926.1, 926.5, 926.7, 927.2, 928, 933.9, 942.8, 943, 943.4, 950, 950.5, 955, 955.1, 955.6, 957, 957.1, 963, 963.2, 966.1, 966.4, DIG.2; 400/111; 707/535; D18/25 [IMAGE AVAILABLE]

91. 4,578,572, Mar. 25, 1986, Modular microprocessor-based system for printing and reading a personal identifier code on a form; John R. Hice, 235/472, 386, 487 [IMAGE AVAILABLE]

92. 4,537,316, Aug. 27, 1985, Modular display for cigarette packs; Virgil S. Simon, et al., 211/133.3, 187 [IMAGE AVAILABLE]

93. 4,528,764, Jul. 16, 1985, Suspended ceiling sign; Ronald W. Cobb, 40/553, 558 [IMAGE AVAILABLE]

94. 4,504,242, Mar. 12, 1985, Modular unit with toy vehicle propulsion device; Philip W. Crain, et al., 446/429, 435 [IMAGE AVAILABLE]

95. 4,494,658, Jan. 22, 1985, Modular display for cigarette packs; Virgil S. Simon, et al., 211/49.1; 40/489, 584; 206/558; 211/126.3 [IMAGE AVAILABLE]

96. 4,489,393, Dec. 18, 1984, Monolithic discrete-time digital convolution circuit; Steven K. Kawahara, et al., 364/728.01, 750.5, 754.01, 758, 768 [IMAGE AVAILABLE]

97. 4,365,245, Dec. 21, 1982, Display module for traveling pattern signs; Gustavo T. Colmenero, 345/1, 56, 213 [IMAGE AVAILABLE]

98. 4,357,772, Nov. 9, 1982, **Modular sign** support; Edward W. Amick, et al., 40/605, 606; 248/159 [IMAGE AVAILABLE]

99. 4,309,811, Jan. 12, 1982, Means and method of reducing the number of masks utilized in fabricating complex multilevel integrated circuits; Donald F. Calhoun, 438/6; 148/DIG.18, DIG.20; 257/734; 438/129 [IMAGE AVAILABLE]

100. 4,281,391, Jul. 28, 1981, Number theoretic processor; Alan Huang, 364/746; 341/83 [IMAGE AVAILABLE]

101. 4,277,904, Jul. 14, 1981, Back lighted sign frame; Fred W. Leuthesser, 40/564, 716, 728, 735 [IMAGE AVAILABLE]

102. 4,263,736, Apr. 28, 1981, Modular display system; William T. Beierwaltes, et al., 40/452, 451, 573, 574, 576; 340/323R; 345/34, 903 [IMAGE AVAILABLE]

103. 4,223,272, Sep. 16, 1980, Four-terminal network of adjustable transfer function; Karl H. Feistel, 330/51, 65, 107, 148 [IMAGE AVAILABLE]

104. 4,220,948, Sep. 2, 1980, Non-electronic character display; Charles E. Trame, 340/815.44; 40/446, 450, 591; 340/815.54, 815.57; 345/34, 109 [IMAGE AVAILABLE]

105. 4,197,116, Apr. 8, 1980, Method and apparatus for automatically controlling the rate of flux injection to a converter; William A. Kolb, 75/387 [IMAGE AVAILABLE]

106. 4,194,181, Mar. 18, 1980, Hotel room status monitor and power control system; Bert W. Brundage, 340/286.08 [IMAGE AVAILABLE]

107. 4,169,328, Oct. 2, 1979, **Modular** display **sign** system; William G. Frick, Jr., 40/612; 116/63R [IMAGE AVAILABLE]

108. 4,161,834, Jul. 24, 1979, Theft proof **modular sign**; Howard K. Hendricks, Jr., 40/606; 248/475.1, 551; 428/916 [IMAGE AVAILABLE]

109. 4,151,718, May 1, 1979, Electronic control for hydraulic press; Edward M. Gravely, Sr., 60/328, 368, 459, 911; 156/580 [IMAGE AVAILABLE]

110. 4,139,894, Feb. 13, 1979, Multi-digit arithmetic logic circuit for fast parallel execution; Jogchum Reitsma, 364/788, 783 [IMAGE AVAILABLE]

111. 4,136,857, Jan. 30, 1979, Method and apparatus for automatically controlling the rate of flux injection to a converter; William A. Kolb, 266/80, 83, 245 [IMAGE AVAILABLE]

112. 4,128,286, Dec. 5, 1978, Portable display wall; Robert E. Windisch, et al., 312/234; 211/86.01; 312/198, 245 [IMAGE AVAILABLE]

113. 4,121,298, Oct. 17, 1978, Central processing unit for numbers represented in the system of residual classes; Izrail Yakovlevich Akushsky, et al., 364/746, 926.1, 926.3, 926.5, 926.7, 929.2, 931, 931.5, 933.3, 935, 935.2, 935.4, 936.1, 937.1, 937.2, 937.3, 937.4, 937.8, 940, 942, 942.8, 943.9, 945.6, 946.2, 946.8, 947, 947.1, 947.2, 947.6, 948.3, DIG.2; 395/562 [IMAGE AVAILABLE]

114. 4,115,923, Sep. 26, 1978, Electronic column gage; David L. Smith, et al., 33/561, 558; 324/207.16 [IMAGE AVAILABLE]

115. 4,076,956, Feb. 28, 1978, Decision network for receiver of PSK digital signals; Renato Dogliotti, et al., 375/332, 269, 328 [IMAGE AVAILABLE]

116. 4,038,756, Aug. 2, 1977, Electronic column gage; David L. Smith, et al., 33/504, 558; 702/166, 168 [IMAGE AVAILABLE]

117. 4,004,175, Jan. 18, 1977, High voltage particle accelerator utilizing polycrystalline ferroelectric ceramic material; Philip S. Brody, 313/360.1; 315/506; 376/113; 976/DIG.418 [IMAGE AVAILABLE]

118. 3,999,977, Dec. 28, 1976, Method for controlling the injection of flux into a steelmaking vessel as a function of pressure differential; William A. Kolb, et al., 75/379, 10.41, 387; 266/80, 83, 89, 214, 243 [IMAGE AVAILABLE]

119. 3,984,833, Oct. 5, 1976, Apparatus for encoding extended run-length codes; David Curtis Van Voorhis, 341/63, 78, 82 [IMAGE AVAILABLE]

120. 3,964,810, Jun. 22, 1976, Modular shelf and cabinet system; Thomas V. Murphy, 312/265.2; 108/147.12, 190; 211/188; 312/111 [IMAGE AVAILABLE]

121. 3,958,351, May 25, 1976, **Modular sign** support assembly; Mike Summey, 40/607; 211/107; 248/230.1 [IMAGE AVAILABLE]

122. 3,956,622, May 11, 1976, Two's complement pipeline multiplier; Richard Francis Lyon, 364/758 [IMAGE AVAILABLE]

123. 3,934,365, Jan. 27, 1976, Sign frame; Clinton L. Stein, et al., 40/545; 38/102.5; 40/603; 160/378 [IMAGE AVAILABLE]

124. 3,931,689, Jan. 13, 1976, Illuminated sign housing construction; William P. Shine, 40/570 [IMAGE AVAILABLE]

125. 3,925,780, Dec. 9, 1975, Apparatus for data compression encoding and decoding; David C. Van Voorhis, 341/63, 67, 78, 106; 358/261.2 [IMAGE AVAILABLE]

126. 3,906,199, Sep. 16, 1975, Digital filter circuit; Robert Bruce Kieburtz, et al., 364/724.03, 759 [IMAGE AVAILABLE]

127. 3,891,973, Jun. 24, 1975, Multi-function digital counter/timer; Jerome Eugene Maxwell, 368/107; 341/50; 364/715.03, 926.1, 926.5, 927.2, 927.5, 928, 928.1, 929.2, 933.1, 933.3, 934, 934.1, 937.1, 937.2, 942.3, 942.4, 942.7, 947, 947.2, 947.6, 965, 965.7, DIG.2; 377/26, 54, 129; 968/802, 846, 900, DIG.1 [IMAGE AVAILABLE]

128. 3,883,972, May 20, 1975, Universal mounting for various signage; Robert L. Propst, et al., 40/617 [IMAGE AVAILABLE]

129. 3,871,633, Mar. 18, 1975, METHOD AND APPARATUS FOR CONTROLLING THE INJECTION OF FLUX INTO A STEELMAKING VESSEL AS A FUNCTION OF PRESSURE DIFFERENTIAL; William A. Kolb, et al., 266/89; 75/378, 533; 266/214, 222

[IMAGE AVAILABLE]

130. 3,848,385, Nov. 19, 1974, MODULAR CEILING CONSTRUCTION; Neil J. Thompson, 52/506.06, 28, 714; 403/173; 454/293 [IMAGE AVAILABLE]

131. 3,845,936, Nov. 5, 1974, MODULAR CRASH CUSHION; Kenneth J. Boedecker, Jr., et al., 256/1; 104/254; 114/219; 256/13.1; 404/6 [IMAGE AVAILABLE]

132. 3,838,412, Sep. 24, 1974, OPTICAL LINK FOR ILLUMINATED TRAVELING MESSAGE DISPLAY SIGN SYSTEM; Clifford M. Jones, et al., 345/56; 340/870.13, 870.19, 870.28; 345/73; 359/135, 142, 158 [IMAGE AVAILABLE]

133. 3,829,999, Aug. 20, 1974, ILLUMINATED **MODULAR** TYPE **SIGN**; Lawrence A. Bernstein, 40/605, 607; 52/648.1, 653.2 [IMAGE AVAILABLE]

134. 3,795,974, Mar. 12, 1974, REPAIRABLE MULTI-LEVEL LARGE SCALE INTEGRATED CIRCUIT; Donald F. Calhoun, 438/6, 128, 599 [IMAGE AVAILABLE]

135. 3,795,973, Mar. 12, 1974, MULTI-LEVEL LARGE SCALE INTEGRATED CIRCUIT ARRAY HAVING STANDARD TEST POINTS; Donald F. Calhoun, 438/6, 128 [IMAGE AVAILABLE]

136. 3,742,633, Jul. 3, 1973, ILLUMINATED DISPLAY SIGN; Bernhard Palm, 40/576, 618 [IMAGE AVAILABLE]

137. 3,731,754, May 8, 1973, ELECTRICAL WEIGHING SYSTEMS; Gilbert Allan Godwin, et al., 177/165, 210R, DIG.3 [IMAGE AVAILABLE]

138. 3,727,185, Apr. 10, 1973, TIME-SHARE TRANSMITTER; Clifford M. Jones, et al., 340/825.62, 825.26; 345/124; 359/135, 158 [IMAGE AVAILABLE]

139. 3,724,455, Apr. 3, 1973, CARDIAC WARNING DEVICE; Paul N. Unger, 600/515; 128/903, 905; 600/519; 607/5 [IMAGE AVAILABLE]

140. 3,722,120, Mar. 27, 1973, DISPLAY SIGN; Henry Finkel, 40/618 [IMAGE AVAILABLE]

141. 3,707,792, Jan. 2, 1973, GRAPHIC DISPLAY SYSTEM; Lindell E. Mabrey, et al., 40/219, 361, 575 [IMAGE AVAILABLE]

142. 3,680,238, Aug. 1, 1972, SIGN DISPLAY APPARATUS; John L. Arnold, 40/564, 605, 615 [IMAGE AVAILABLE]

143. 3,678,653, Jul. 25, 1972, ELECTROSTATIC PRECIPITATOR; Elmer W. Buschman, 96/66, 72, 78, 100 [IMAGE AVAILABLE]

144. 3,659,665, May 2, 1972, ELECTRICAL WEIGHING SYSTEMS WITH MULTIPLE INCREMENTAL READOUTS; Gilbert Allan Godwin, et al., 177/1, 3, 210R, DIG.3 [IMAGE AVAILABLE]

145. 3,653,146, Apr. 4, 1972, MODULAR TOY; Adolph E. Goldfarb, 446/113; 52/175; 446/423 [IMAGE AVAILABLE]

146. 3,636,553, Jan. 18, 1972, ALPHA-NUMERIC DISPLAY SYSTEM; Bruce Jay Hancock, 345/55, 73 [IMAGE AVAILABLE]

147. 3,590,508, Jul. 6, 1971, TRAVELING SIGN CONTROLLED BY LOGIC CIRCUITRY AND PROVIDING A PLURALITY OF DIGITAL DISPLAY EFFECTS; Clifford M. Jones, et al., 40/573 [IMAGE AVAILABLE]

08/807,567

=> d l5 1-50

1. **5,736,965**, Apr. 7, 1998, Compact radio frequency transmitting and receiving antenna and control device employing same; Donald R. Mosebrook, et al., 343/702; 315/312; 343/700MS, 745; 455/90 [IMAGE AVAILABLE]

2. **5,721,737**, Feb. 24, 1998, Serial transmission system for controlling a network of I/O devices; Bahman Radjabi, et al., 370/449; 340/825.08; 370/475; 395/290 [IMAGE AVAILABLE]

3. **5,678,646**, Oct. 21, 1997, Propulsion system and kit for hybrid motor vehicle; Hans Fliege, 180/65.1; 310/112 [IMAGE AVAILABLE]

4. **5,672,943**, Sep. 30, 1997, Electronic control apparatus; Peter Vivers, 318/103; 200/51.05; 307/40; 318/112 [IMAGE AVAILABLE]

5. **5,652,420**, Jul. 29, 1997, Modular contactor control system; Mark E. Innes, et al., 200/50.32, 307; 335/132, 202; 361/729 [IMAGE AVAILABLE]

6. **5,644,407**, Jul. 1, 1997, Image processing apparatus having a remote communication function; Asao Watanabe, et al., 358/434, 402, 403, 444, 456 [IMAGE AVAILABLE]

7. **5,615,106**, Mar. 25, 1997, Control device; Tooru Yoshino, et al., 364/140.02, 138; 395/829 [IMAGE AVAILABLE]

8. **5,544,037**, Aug. 6, 1996, Control arrangement for consumer units which are allocated to groups; Siegfried Luger, 364/146; 315/291; 340/825.52 [IMAGE AVAILABLE]

9. **5,506,602**, Apr. 9, 1996, Display control apparatus and method whereby a display identifies its display control method to a display controller in order that the display controller can configure itself to output the display control signals corresponding to the identified display co; Noboru Yokoyama, 345/132, 11; 364/237.3, 239.3, DIG.1; 395/500, 830, 834 [IMAGE AVAILABLE]

10. **5,493,194**, Feb. 20, 1996, Control signal and power bus connector arrangement for a multi-axis motor control; Michael Damiano, et al., 318/575; 307/71; 318/567; 361/733; 439/928; D13/162.1 [IMAGE AVAILABLE]

11. **5,465,101**, Nov. 7, 1995, Display device; Nobuo Akiba, et al., 345/1, 903; 348/383 [IMAGE AVAILABLE]

12. **5,428,672**, Jun. 27, 1995, Communication apparatus; Takehiro Yoshida, et al., 379/100.15; 358/401, 442 [IMAGE AVAILABLE]

13. **5,384,697**, Jan. 24, 1995, Networked facilities management system with balanced differential analog control outputs; Gregory A. Pascucci, 364/139 [IMAGE AVAILABLE]

14. **5,361,260**, Nov. 1, 1994, Communication system; Jun-ichi Mito, 370/452; 318/41; 370/460, 503 [IMAGE AVAILABLE]

15. **5,313,104**, May 17, 1994, Vehicle control system over a plurality of transmission lines; Mineharu Shibata, et al., 307/10.1, 40 [IMAGE AVAILABLE]

16. **5,307,058**, Apr. 26, 1994, Remote supervisory and controlling system; Toshiaki Tokizane, et al., 340/825.07, 310.06 [IMAGE AVAILABLE]

17. **5,258,652**, Nov. 2, 1993, Distributed plant control system; Seiitsu Nigawara, et al., 307/38, 17, 19, 29 [IMAGE AVAILABLE]

18. **5,254,908**, Oct. 19, 1993, Sign board lighting control system; Larry G. Alt, et al., 315/312; 340/825.49 [IMAGE AVAILABLE]

19. **5,214,769**, May 25, 1993, Multiprocessor control system; Nobuo Uchida, et al., 711/151; 364/230, 230.1, 238.4, 242.6, 242.7, 242.91, 243, 243.1, 931.46, DIG.1, DIG.2; 711/148, 167 [IMAGE AVAILABLE]

20. **5,189,617**, Feb. 23, 1993, Motor vehicle control system and control unit therefor; Takashi Shiraishi, 701/48, 1 [IMAGE AVAILABLE]

21. **5,157,658**, Oct. 20, 1992, Method and apparatus for identifying newly installed modem in dial-up network; Kazushige Arai, et al., 370/254; 340/825.07, 825.08, 825.52; 370/475; 375/222 [IMAGE AVAILABLE]

22. **5,138,701**, Aug. 11, 1992, Data communication control system; Tadashi Ohira, et al., 395/200.38; 364/222.2, 226, 230, 230.4, 232.7, 237.2, 237.9, 241, 241.9, 242.1, 266.5, 268.9, 284.4, DIG.1 [IMAGE AVAILABLE]

23. **5,138,376**, Aug. 11, 1992, Image forming apparatus including control system provided with a master control unit and a plurality of subsidiary control units; Syuzi Maruta, et al., 399/9 [IMAGE AVAILABLE]

24. **5,117,421**, May 26, 1992, Remote supervisory and controlling system; Toshiaki Tokizane, et al., 370/221; 340/825.07; 370/522 [IMAGE AVAILABLE]

25. **5,077,554**, Dec. 31, 1991, Control system for communication between units; Akira Orita, et al., 340/825.2; 370/274; 375/212 [IMAGE AVAILABLE]

26. **5,061,921**, Oct. 29, 1991, Remote-controlled message sign; Darryl S. Lesko, et al., 340/815.83, 311.1, 815.45, 815.62, 815.64, 825.44 [IMAGE AVAILABLE]

27. **5,056,023**, Oct. 8, 1991, Diagnosis system for motor vehicle; Kunihiro Abe, 701/32; 73/117.3; 340/439; 701/99 [IMAGE AVAILABLE]

28. **5,008,662**, Apr. 16, 1991, Remote supervisory and controlling machine; Toshiaki Tokizane, et al., 340/825.06, 825.07; 359/135, 142 [IMAGE AVAILABLE]

29. **4,991,123**, Feb. 5, 1991, Alarm system; Mario D. Casamassima, 340/825.08, 525, 825.1, 825.11 [IMAGE AVAILABLE]

30. **4,945,473**, Jul. 31, 1990, Communications controller interface; Thomas O. Holtey, et al., 395/500; 364/222.2, 222.3, 232.2, 232.3, 238.2, 239, 246, 246.3, 247, 247.8, DIG.1; 395/200.8, 733 [IMAGE AVAILABLE]

31. **4,916,642**, Apr. 10, 1990, Environmental control with multiple zone central processor means; Frederick P. Kaiser, et al., 364/528.13; 165/205; 236/49.3; 340/310.01, 310.06, 538 [IMAGE AVAILABLE]

32. **4,855,729**, Aug. 8, 1989, Communication control system of fluid control valve; Kunihiko Takeuchi, et al., 340/825.05; 137/487.5; 340/825.07; 359/143, 144, 165 [IMAGE AVAILABLE]

33. **4,818,993**, Apr. 4, 1989, Electronic control system for controlling several remote devices; Gunter Stockel, 340/825.06, 825.22 [IMAGE AVAILABLE]

34. **4,747,041**, May 24, 1988, Automatic power control system which automatically activates and deactivates power to selected peripheral devices based upon system requirement; Gary L. Engel, et al., 395/750.06; 307/29, 39; 340/825.06, 825.22; 364/187, 528.21, 707, DIG.1 [IMAGE AVAILABLE]

35. **4,742,475**, May 3, 1988, Environmental control system; Frederick P. Kaiser, et al., 364/528.13; 165/208; 236/49.3; 340/310.02, 310.06, 538; 364/138 [IMAGE AVAILABLE]

36. **4,672,374**, Jun. 9, 1987, System for bilateral communication of a command station with remotely located sensors and actuators; Paul A. Desjardins, 340/825.07, 825.1, 825.54 [IMAGE AVAILABLE]

37. **4,642,473**, Feb. 10, 1987, Electrical circuit arrangement and electrical circuit unit for use in such an electrical circuit arrangement; Stewart F. Bryant, 307/38, 40, 41 [IMAGE AVAILABLE]

38. **4,639,889**, Jan. 27, 1987, System for controlling communication between a main control assembly and programmable terminal units; Hiromichi Matsumoto, et al., 395/185.08; 235/379; 364/940.71, DIG.2; 902/39 [IMAGE AVAILABLE]

39. **4,638,453**, Jan. 20, 1987, Signal processing unit; Paul Gran, et al., 395/824; 364/919.2, 919.4, 921, 921.8, 926.9, 927.8, 928, 931, 931.4, 937, 942.3, 942.4, 949, 949.1, 960, 960.6, DIG.2 [IMAGE AVAILABLE]

40. **4,510,867**, Apr. 16, 1985, Control system for ink zone adjusters; Karl-Heinz Forster, et al., 101/365, DIG.47 [IMAGE AVAILABLE]

41. **4,406,085**, Sep. 27, 1983, Modular radio control for use with multiple toy vehicles; Tony Rhodes, 446/456 [IMAGE AVAILABLE]

42. **4,342,985**, Aug. 3, 1982, Remote sensing and control system; Paul A. Desjardins, 340/525, 505, 518, 825.1, 825.54, 870.09 [IMAGE AVAILABLE]

43. **4,296,464**, Oct. 20, 1981, Process control system with local microprocessor control means; Rodney G. Woods, et al., 395/306; 364/221, 221.7, 228.5, 237.8, 238.3, 238.5, 239, 239.2, 239.3, 240, 240.1, 240.2, 240.5, 242.3, 260, 260.1, 260.4, 260.81, 261, 264, 264.5, 265, 265.1, DIG.1 [IMAGE AVAILABLE]

44. **4,253,087**, Feb. 24, 1981, Self-assigning address system; Harry J. Saal, 340/825.52; 361/683, 777 [IMAGE AVAILABLE]

45. **4,247,908**, Jan. 27, 1981, Re-linked portable data terminal controller system; Robert K. Lockhart, Jr., et al., 395/200.75; 364/918.7, 919.2, 925, 925.2, 926, 927, 927.2, 927.5, 927.8, 927.92, 928, 929, 931, 931.4, 932.8, 933.9, 935, 935.2, 935.3, 937, 939, 939.2, 940, 940.1, 940.2, 940.6, 940.61, 940.68, 942.3, 942.51, 942.8, 943.9, 943.91, 944.2, 949, 949.71, 952, 952.4, 959.1, 964, 964.1, 965, 965.4, 965.5, 965.76, 976, 976.1, DIG.2; 455/38.1 [IMAGE AVAILABLE]

46. **4,163,218**, Jul. 31, 1979, Electronic multiple device control system; William I. L. Wu, 340/310.02; 307/3; 340/825.62, 825.69 [IMAGE AVAILABLE]

47. **4,137,522**, Jan. 30, 1979, Remote control apparatus for a plurality of controllable objects; Hermann Stein, 340/825.21, 825.51; 377/33 [IMAGE AVAILABLE]

48. **4,131,881**, Dec. 26, 1978, Communication system including addressing apparatus for use in remotely controllable devices; Paul B. Robinson, 340/825.53, 310.02, 825.47, 825.68 [IMAGE AVAILABLE]

49. **4,117,459**, Sep. 26, 1978, Time-out interface means; Robert H. Douglas, et al., 395/185.08 [IMAGE AVAILABLE]

50. **3,697,821**, Oct. 10, 1972, LIGHT DIMMING SYSTEM HAVING MULTIPLE CONTROL UNITS; James C. Johnson, 361/205; 307/112, 115; 315/194; 340/825.77 [IMAGE AVAILABLE]

08/805,567

> d l10

1. 5,717,424, Feb. 10, 1998, Banner display device; Anton K. Simson, et al., 345/110 [IMAGE AVAILABLE]

=> d l10 fro hit

US PAT NO: 5,717,424 [IMAGE AVAILABLE] L10: 1 of 1
DATE ISSUED: Feb. 10, 1998
TITLE: Banner display device
INVENTOR: Anton K. Simson, 13227 Aubrey St., Poway, CA 92064
Peter C. Brusso, 14530 Espola Rd., Suite A, Poway, CA 92064
APPL-NO: 08/605,974
DATE FILED: Feb. 23, 1996
REL-US-DATA: Continuation-in-part of Ser. No. 195,394, Feb. 14, 1994, Pat. No. 5,493,802, which is a continuation-in-part of Ser. No. 67,738, May 26, 1993, Pat. No. 5,410,330.
INT-CL: [6] G09G 3/00
US-CL-ISSUED: 345/110
US-CL-CURRENT: 345/110
SEARCH-FLD: 345/57, 110; 318/6, 7; 352/174, 180; 353/109; 40/471
REF-CITED:

U.S. PATENT DOCUMENTS

3,510,973	5/1970	Mazzocco, Sr.	40/31
3,726,031	4/1973	Singer	40/31
4,012,674	3/1977	Spitsbergen et al.	318/6
4,448,368	5/1984	Skalko	318/7
4,720,661	1/1988	Kisakibaru et al.	
4,862,614	9/1989	Shettleroe	40/593
4,942,411	7/1990	Polston	
5,174,055	12/1992	Aiken	40/471
5,410,330	4/1995	Simson et al.	
5,440,214	8/1995	Peeters	318/685
5,493,802	2/1996	Simson	

ART-UNIT: 245
PRIM-EXMR: Jeffery Brier
LEGAL-REP: Henri J. A. Charmasson, John D. Buchaca

ABSTRACT:
A banner display device where a plurality of banners are mounted end-to-end to form a scroll which is wound on a pair of parallel and spaced-apart rollers, each driven by a **motor**. Pulse code modulated drive voltages are produced by microprocessor based command and control circuitry to accurately and efficiently turn the motors at speeds which impart proper tensioning of the scroll during winding.
9 Claims, 24 Drawing Figures

US PAT NO: 5,717,424 [IMAGE AVAILABLE] L10: 1 of 1

ABSTRACT:
A banner display device where a plurality of banners are mounted end-to-end to form a scroll which is wound on a pair of parallel and spaced-apart rollers, each driven by a **motor**. Pulse code modulated drive voltages are produced by microprocessor based command and control circuitry to accurately and efficiently turn the motors at speeds which impart proper tensioning of the scroll during winding.

SUMMARY:

BSUM(8)

3) The command and control circuitry is expensive, awkward and of limited configurability with respect to individual banner display times and relative **motor** tensioning due to differently sized charts.

SUMMARY:

BSUM(19)

As stated above, the third problem involves the relatively expensive command and control circuitry provided in current scrolling display devices. Simson et al., U.S. Pat. No. 5,410,330 discloses circuitry designed specifically for controlling the variable **motor** speeds required during the display of a roller based scrolling chart display. However, this circuitry has limited configurability with respect to roller speeds and display times per banner. Also, in general, the cost of manufacturing a circuit board and soldering components generally increases with the number of components used. In addition, a circuit made up of numerous discretely manufactured electronic devices is usually less reliable than those circuits requiring less discrete devices. Also, increasing the amount of hardware increases power consumption, which in turn may increase the number and cost of discrete devices. Accordingly, there is a need for an inexpensive scroll display apparatus which uses a minimum of hardware while providing greater command and control flexibility.

DETDESC:

DETD(3)

Each roller can be rotatively mounted on a pair of spindles 8,9 each extending inwardly from one of a pair of opposing lateral support members 10,11. One of the pair of spindles is a drive spindle 9 which is mechanically coupled through a transmission to a **motor** 12, the other spindle 8 is spring loaded to allow for quick installation and removal of the rollers.

DETDESC:

DETD(9)

An **optical** chart position **sensor** 15 is mounted preferably on the support member carrying the other circuitry. The **sensor** is positioned on the chart guide 17 at a point between the two rollers, to detect the passage of indicia or marks placed along the corresponding edge of each chart frame containing a banner. The detailed operation of the **sensor** and indicia features will be described later.

DETDESC:

DETD(16)

Torque is transmitted from the motors to the drive spindles via transmission means. Although it would be possible to have the **motor** drive shaft act as the rotational axle for the drive spindle, this would generally require the relatively bulky **motor** to exist lateral to an end of the roller. In the preferred approach, referring to FIG. 3, the a **motor** 12 directly drives a **motor** pulley 55, the rotation of which is transmitted to a roller drive pulley 56 through a belt 57. The roller drive pulley turns the axle of the drive spindle 9. In this way the bulk of the **motor** 12 can be located between the mounted rollers 6,7 and behind the exposed portion of the chart, thereby reducing the required width of the display apparatus. Further, the use of this type of belt and

pulley assembly provides a damping mechanism between the motors and the rollers, reducing the transmission of noise and vibration. The belt and pulleys may be toothed to prevent slippage.

DETDESC:

DETD(17)

With reference to FIGS. 1, 7, 8 and 10 the preferred banner flattening mechanisms will now be described. FIG. 1 shows a plurality of banners 1,2,3, each made of pliable, laminar material, attached end-to-end to form a scroll. The scroll is carried upon a carrier web 4 of pliable, durable, substantially transparent material such as **mylar**. The **scroll** and web collectively form a chart 5 which is scrollable between two parallel, spaced apart rollers 6,7.

DETDESC:

DETD(32)

As disclosed in Simson et al., U.S. Pat. No. 5,410,330, incorporated herein by reference, it is beneficial for the unwinding **motor** to provide a variable drag, as transmitted through the scroll, on the winding **motor**. This causes the scroll to remain taut and to traverse smoothly between the rollers. In addition, the unwinding **motor** provides energy efficient assistance in moving the chart. In the preferred embodiment of the invention, drag is accomplished by powering the unwinding **motor** using a pulse width modulated (PWM) drive voltage waveform in which the duty cycle duration is less than the duty cycle duration of the drive voltage waveform powering the pick-up **motor**.

DETDESC:

DETD(33)

A PWM drive voltage waveform may also be used to prevent sagging or drooping of the chart while a banner is being displayed. This can be a problem with heavier banners and fabric or paper banners which have become saturated with water. During non-winding times, one or both of the motors are given a PWM driving waveform having a winding polarity to stretch the chart taut. In this embodiment, of course, the winding polarity of one **motor** is opposite to the winding polarity of the other **motor**.

DETDESC:

DETD(35)

In general, FIG. 9 shows a functional block diagram of the major modules. The circuitry comprises a power supply circuit 120, motors 12,13, an immediate **motor** control circuit 121, a photo-electric chart frame sensor circuit 122, a microprocessor 123, and a user/operator input circuit 124.

DETDESC:

DETD(36)

The microprocessor 123 interprets signals from the chart sensor circuit and user input circuitry using its internal programming to generate commands, including the PWM **motor** control signals for directing the immediate **motor** control circuitry 121 to move the motors. The microprocessor can be implemented using PIC or other commonly available computer. Here, the computer is a small 4 Kbyte programmable device having a 4 MHz exterior crystal oscillator and has interior bypass capacitors. It is programmed via a developmental system linked to a

standard personal computer. Therefore, it is reprogrammable to fit the needs of a particular application with respect to display time parameters including variable time display, variable time of day or week display, or even units that can respond to a pager signal. The program inside the microprocessor contains all the control logic, command structure and PWM algorithms.

DETDESC:

DETD(37)

The immediate **motor** control circuitry 121 simply applies the proper drive voltage waveforms to the motors 12,13 according to the command signals arriving from the microprocessor 123. The circuitry also provides for dynamic braking of the motors to lessen motion due to inertia. The preferred approach involves implementing the immediate **motor** control circuitry with a solid state **motor** control chip, such as an Allegro **motor** control chip, for each **motor** and overload protection. These chips can receive and implement PWM **motor** control signals and other commands directly from the microprocessor. Solid state control is preferred due to its smaller size and the fact that relays generally make and break circuits under load, thereby burning contacts and lessening reliability with time.

DETDESC:

DETD(45)

The power supply circuitry 120 provides a first operational voltage 130 used to power the integrated circuit based microprocessor 123 and immediate **motor** control 121. A second line 131 supplies the **motor** operational voltage to the motors through the immediate **motor** control circuitry. A third line 132 provides the proper voltage for the operation of the chart frame **optical sensor** circuit.

DETDESC:

DETD(46)

In the preferred embodiment, the power supply comprises the plug-in transformer which provides 12 volts A.C. to a rectifier circuit which converts it to the **motor** operational voltage of 17.5 volts D.C. The power supply further comprises 12 volt and 5 volt regulators, such as 7812 and 7805 TO-220 configuration devices, which are linear integrated circuits containing built-in current protection circuitry. These regulators are configured into a filtered, anti-droop circuit for providing stable power to the chart sensor circuit, and the microprocessor and immediate **motor** control chips.

DETDESC:

DETD(49)

FIG. 13 shows a rear view of an edge section of the scrolling chart 5. Shown is the rear surface 141 of the carrier web 4 at a point between chart frames where two banners 1,2 are attached to a resilient strip 60. A user manipulable chart frame indicator 140 is positioned on a portion of the web 4 proximate to the edge 142 so that it may be scanned by the **optical sensor** described earlier.

DETDESC:

DETD(52)

Therefore, the placement of a tab into a sub-window alters an **optical** characteristic of the sub-window which can be read by the

optical sensor. In this case the altered characteristic is reflectivity. In a transmissive scheme, the altered characteristic would be the transparency of the sub-window.

DETDESC:

DETD(57)

Alternatively, the indicator may be modified to contain even more information providing individual frame control, such as custom viewing times. For example, the **optical sensor** can be a bar code reader. A bar code may be printed on an adhesive tape label which is placed when the banner is installed. If the frame is to be skipped, the label is removed.

CLAIMS:

CLMS(1)

What is claimed is:

1. A display apparatus which comprises:
a scroll having a leading end and a trailing end;
a first roller having said leading end wound thereupon;
a second roller having said trailing end wound thereupon;
means for rotatively and detachably mounting said first and second rollers;
means for holding said first and second rollers in a substantially parallel and spaced-apart position in relation to each other;
a first and second **motor**;
means for operating said motors in concert;
said means for holding comprises:
an opposable pair of support members; and
means for securing said support members to an enclosure in a substantially parallel, spaced apart and opposing orientation; and
wherein a first one of said pair of support members comprises:
said first and second motors being attached thereon;
first means for driving said first roller with said first **motor**; and,
second means for driving said second roller with said second **motor**;
wherein said means for operating comprise electrical circuit means for powering said motors;
wherein said circuit means comprises:
means for generating a pulse width modulated **motor** drive signal.

CLAIMS:

CLMS(2)

2. In a banner display apparatus having a scrollable chart comprising a plurality of banner holding frames, an improvement comprising:
means for controlling the display of a banner associated with a first one of said frames;
a scroll having a leading end and a trailing end;
a first roller having said leading end wound thereupon;
a second roller having said trailing end wound thereupon;
means for rotatively and detachably mounting said first and second rollers;
means for holding said first and second rollers in a substantially parallel and spaced-apart position in relation to each other;
a first **motor** and means for driving said first roller with said first **motor**;
a second **motor** and means for driving said second roller with said second **motor**; and
means for controlling the relative speeds of said rollers to keep a displayed portion of said scroll consistently taut between said

rollers;
wherein said means for controlling comprise:
means for powering said second **motor**;
means for rotating said second roller, via said scroll, at a speed faster than that provided by said means for powering said second **motor**;
means for generating a first **motor** drive signal having a first duty cycle; and,
means for generating a pulse width modulated second **motor** drive signal having a second duty cycle of less duration than said first duty cycle.

CLAIMS:

CLMS(3)

3. The apparatus of claim 2, wherein said means for generating a first **motor** drive signal and said means for generating a second **motor** drive signal comprise a programmed microprocessor.

CLAIMS:

CLMS(4)

4. A scroll display device which comprises:
a scroll made of pliable, sheet material having opposite ends wound upon a pair of parallely spaced apart, rotatively mounted rollers;
motor means for alternately winding and unwinding said scroll between said rollers, thereby successively displaying sections of said scroll; and
electrical circuit means for powering said **motor** means, wherein said circuit means comprise:
means for generating a pulse width modulated **motor** drive signal.

CLAIMS:

CLMS(5)

5. The device of claim 4, wherein said means for generating a pulse width modulated **motor** drive signal comprise:
means for generating a first **motor** drive signal having a first duty cycle; and,
means for generating a pulse width modulated second **motor** drive signal having a second duty cycle of less duration than said first duty cycle.

CLAIMS:

CLMS(6)

6. The device of claim 4, wherein said means for generating a pulse width modulated **motor** drive signal comprise a programmed microprocessor.

CLAIMS:

CLMS(7)

7. The device of claim 4, wherein said **motor** means comprise:
a first **motor** operatively associated with a first one of said rollers; and
a second **motor** operatively associated with a second one of said rollers.

CLAIMS:

CLMS(8)

8. The device of claim 7, wherein said circuit means for powering further comprise means for powering said second **motor** while said second one of said rollers is unwinding.

CLAIMS:

CLMS(9)

9. The device of claim 8, wherein said circuit means for powering further comprises:
means for rotating said second one of said rollers, via said scroll, at a speed faster than that provided by said means for powering said second **motor**.